



## Level 1 Industrial Hydraulics

Course Number 20

### Course Description

This course correlates fluid power principles with machine operation and daily maintenance duties. Procedures to ensure safety of maintenance personnel and prevent damage to machine will be covered. Fluid power symbols will be compared to the physical components. Location of components in a hydraulic system and proper adjustment procedures will be identified. Hands-on exercises will reinforce location, proper component connections, and effects of adjustments on system operation. Elimination of leaks by proper fitting selection and installation will be discussed. Significance of fluid cleanliness to system longevity and techniques to minimize ingress of contaminants will be presented. 50% is hands-on.

Prerequisites: None

Course Length: 3 or 5 days

Textbooks: Industrial Hydraulic CFC Lab Book

Course Outline	Learning Objectives
<p>Safety</p> <ul style="list-style-type: none"> <li>- Lock-out/Tag-out</li> <li>- Confirming de-pressurized hydraulic lines</li> </ul> <p>Conductors and Connectors</p> <ul style="list-style-type: none"> <li>- Hose connectors, construction, sizing, ratings</li> <li>- Steel tubing</li> </ul> <p>Hydraulic Fundamentals, Fluids and Reservoirs</p> <ul style="list-style-type: none"> <li>- Conductor flows and sizing</li> <li>- Filter use, locations and sizing, intake, return &amp; pressure</li> </ul> <p>Actuators (Telescoping, Rams, Single Acting etc)</p> <ul style="list-style-type: none"> <li>- Construction, operation and applications</li> <li>- Regeneration circuits</li> </ul> <p>Pressure Controls</p> <ul style="list-style-type: none"> <li>- Construction, operation and applications</li> <li>- Proper use of relief, reducing, sequence, counterbalance, unloading and brake valves</li> </ul> <p>Pumps and Pumping Principles</p> <ul style="list-style-type: none"> <li>- Construction, operation and applications of gear, vane and piston pumps</li> <li>- Start-up and troubleshooting techniques</li> </ul> <p>Flow Controls and Flow Dividers</p> <ul style="list-style-type: none"> <li>- Construction, theory and operation</li> <li>- Meter-in verses meter-out, pressure compensated vs non-compensated</li> </ul> <p>Directional Controls</p> <ul style="list-style-type: none"> <li>- Construction, operation and applications</li> <li>- Single and pilot operated designs</li> </ul> <p>Accumulators &amp; Accessories</p> <ul style="list-style-type: none"> <li>- Construction, theory and operation</li> <li>- Pre-charge requirements and maintenance</li> </ul>	<ul style="list-style-type: none"> <li>• Practice safe procedures to ensure trapped fluids have been relieved internally and suspended loads have been lowered or properly blocked to permit safe maintenance operations</li> <li>• Explain hydraulic pressure-force and flow-speed relationships</li> <li>• Identify and correlate the standard schematic symbols to the hydraulic components and typical locations in a hydraulic system</li> <li>• Use charts to determine actuator force and speed for given pressure and flow</li> <li>• Recognize typical cylinder construction and utilize diagnostic procedures</li> <li>• Identify/classify relief, sequence, unloading, reducing, and counterbalance valves.</li> <li>• Distinguish between meter-in vs. meter-out flow control</li> <li>• Identify schematic symbol and operational differences of directional control valves</li> <li>• Identify/classify the different types of hydraulic pumps</li> <li>• Proper installation of hydraulic components with respect to alignment, connections, and pre-filling with fluids</li> <li>• Identify and work with the fluid conductors used to carry hydraulic fluid to ensure proper pressure ratings, routing, and to reduce failures</li> <li>• Implement leak prevention using proper fittings, assembly techniques, and seal materials</li> <li>• Identify different types of filtration and understand contamination levels</li> </ul>

